assembly in response to temperature changes in the structure and lens assembly, whereby the lens assembly remains substantially focused in relation to the optical components.

REMARKS

Claims 1-14 are pending in the application. The Drawings are objected to as failing to comply with 37 CFR 1.84(p)(5). The Abstract is objected to as exceeding 150 words. Claims 1, 7, 8, and 14 are objected for various informalities. Claims 1, 4-6, 8 and 11-13 are rejected under 35 U.S.C. 103(a) as being unpatentable over Keyworth et al. (U.S. Patent No. 6,134,359) in view of Ogusu et al. (U.S. Patent No. 5,799,118). Claims 2, 3, 9 and 10 are rejected under 35 U.S. C. 103(a) as being unpatentable over Keyworth in view of Ogusu, further in view of Jamieson (Article: Thermal Effects in Optical Systems). Claims 7 and 14 are rejected under 35 U.S.C. 103(a) as being unpatentable over Keyworth in view of Ogusu as applied to claims 1 and 7, and further in view of Jamieson and Olivieri et al. (Article: Analysis of Defocusing Thermal Effects in Optical Systems). Claims 1-14 are provisionally rejected under the judicially created doctrine of obviousness-type double patenting over claims 1-5, 9-11, 14-18, 21, 24-28, 32-34, 37-41, and 44 of co-pending Application No. 09/724,771.

Applicant respectfully requests favorable consideration of the Application in light of the amendments and remarks contained herein.

Drawings

The drawings are objected to as failing to comply with 37 CFR 1.84(p)(5), because they include the following reference signs not mentioned in the description: 1, in Figs. 5A-5D; 30 in Fig.

6; 145, 150, and 155 in Fig. 8. Applicant is submitting herewith amended drawings changing reference 1 to 11 and deleting references 145, 150, and 155. The specification has been amended to mention reference 30. No new matter has been added. In light of the above, Applicant respectfully submits that the drawings are in condition for allowance.

Specification

The Abstract of the disclosure is objected to because it exceeds 150 words in length. Applicant has amended the Abstract to contain fewer than 150 words, and respectfully submits that the Abstract, as amended, is in condition for allowance.

Claim Objections

Claims 1, 7, 8, and 14 are objected for various informalities. Claim 1 is objected to for lacking antecedent basis of "the lens" in line 12. Claim 1, has accordingly been amended to recite "the lens assembly." Claim 1 is further objected to for lacking antecedent basis of "the change" in line 16. Claim 1 has accordingly been amended to recite "a change." Claim 7 is objected to for lacking antecedent basis of "the lens" in lines 3, 5, and 6. Claim 7 has accordingly been amended to recite "the lens assembly." Claim 8 is objected to for lacking antecedent basis of "the change" in line 17. Claim 8 has accordingly been amended to recite "a change." Claim 14 is objected to for lacking antecedent basis of "the lens" in lines 3, 5, and 6. Claim 14 has accordingly been amended to recite "the lens assembly." In light of the above, Applicant submits theses amendments remedy the informalities objected to by the Examiner; and therefore Applicant respectfully requests withdrawal of the objections to claims 1, 7, 8 and 14.

Claim Rejections **- 35 U.S.C. § 103**

Claims 1, 4-6, 8 and 11-13 are rejected under 35 U.S.C. 103(a) as being unpatentable over Keyworth et al. (U.S. Patent No. 6,134,359) in view of Ogusu et al. (U.S. Patent No. 5,799,118).

Independent claim 1 is drawn to a WDM having a diffraction grating "wherein the coefficient of thermal expansion of the diffraction grating is ***a value chosen to be approximately equal*** to a negative of a change of index of refraction with temperature of air," (emphasis added). As noted by the Examiner, Keyworth fails to disclose this limitation. Ogusu, however, also fails to disclose choosing the coefficient of thermal expansion of the diffraction grating to be approximately equal to a negative of a change of index of refraction with temperature of air. Therefore, the combination of Keyworth and Ogusu fails to disclose each and every limitation of claim 1, and claim 1 is therefore allowable.

At column 3, lines 9-13, Ogusu teaches that "to reduce the temperature dependency of the wavelength transmission characteristic it is required that the diffraction grating be made of material which has a small thermal expansion coefficient and be placed in a medium whose refraction index changes only a little." Ogusu thus advocates choosing both the coefficient of thermal expansion (hereinafter CTE) of the diffraction grating and the change of index of refraction with temperature (hereinafter dn/dt) of the medium about the diffraction grating ***to be small***. There is, however, no mention that the CTE of the diffraction grating be ***chosen to be approximately equal*** to the negative of the dn/dt of air as is required by claim 1. Choosing the CTE of the diffraction grating and the dn/dt

of the medium about the diffraction grating to be small is different than choosing the values to be approximately equal, even in the case where the medium is air. For example, in accordance with the teachings of Ogusu, given a choice between a diffraction grating material with a CTE that is much smaller than the -dn/dt of air and a diffraction grating material with a CTE that is approximately equal to the -dn/dt of air, Ogusu advocates choosing the smaller CTE. Accordingly, because the combination of Ogusu and Keyworth does not teach or suggest each and every limitation of claim 1, and Applicant respectfully requests withdrawal of the rejection of claim 1 under 35 U.S.C. § 103.

Claims 4-6 depend from independent claim 1. Applicant respectfully requests withdrawal of the rejections of claims 4-6 for at least the same reasons as claim 1.

Claim 8 is drawn to an optical network including a diffraction grating "wherein the coefficient of thermal expansion of the diffraction grating is a value chosen to be approximately equal to a negative of a change of index of refraction with temperature of air." As above Keyworth fails to disclose this limitation. Ogusu also fails to disclose this limitation, and rather advocates choosing a diffraction grating CTE to be small. Accordingly, because the combination of Ogusu and Keyworth does not teach or suggest each and every limitation of claim 8, and Applicant respectfully requests withdrawal of the rejection of claim 8 under 35 U.S.C. § 103.

Claims 11 and 13 depend from claim 8. Applicant respectfully requests withdrawal of the rejections of claims 11 and 13 for at least the same reasons as claim 8.

Claims 2, 3, 9 and 10 are rejected under 35 U.S. C. 103(a) as being unpatentable over Keyworth in view of Ogusu, further in view of Jamieson (Article: Thermal Effects in Optical Systems). Claims 2 and 3 depend from claim 1 and claims 9 and 10 depend from claim 8. As noted

above, the combination of Keyworth and Ogusu fails to disclose each and every limitation of claims 1 and 8, because it fails to disclose the CTE of the diffraction grating chosen to be approximately equal to a negative of the dn/dt of air. Jamieson has not further been shown to disclose this limitation. Accordingly, because it has not been shown that the combination of Keyworth, Ogusu, and Jamieson disclose each and every limitation of claims 2, 3, 9 and 10, Applicant respectfully requests withdrawal of the rejections of these claims under 35 U.S.C. § 103.

Claims 7 and 14 are rejected under 35 U.S.C. 103(a) as being unpatentable over Keyworth in view of Ogusu as applied to claims 1 and 8, and further in view of Jamieson and Olivieri et al. (Article: Analysis of Defocusing Thermal Effects in Optical Systems). Claims 7 and 14 depend from claims 1 and 8 respectively. As noted above, the combination of Keyworth and Ogusu fails to disclose each and every limitation of claims 1 and 8, because it fails to disclose the CTE of the diffraction grating chosen to be approximately equal to a negative of the dn/dt of air. Jamieson has not further been shown to disclose this limitation. Furthermore, Olivieri has also not been shown to disclose this limitation. Accordingly, because it has not been shown that the combination of Keyworth, Ogusu, Jamieson, and Olivieri disclose each and every limitation of claims 7 and 14, Applicant respectfully requests withdrawal of the rejections of claims 7 and 14 under 35 U.S.C. § 103.

Double Patenting

Claims 1-14 are provisionally rejected under the judicially created doctrine of obviousness-type double patenting as being unpatentable over claims 1-5, 9-11, 14-18, 21, 24-28, 32-34, 37-41, and 44 of copending Application No. 09/724,771. Although Applicant respectfully disagrees that claims 1-14 are not patentably distinct from the claims identified in the 09/724,771 application, in the interests of expiditing prosecution, Applicant is submitting a terminal disclaimer in accordance with 37 CFR 1.321(c) herewith. The 09/724,771 application and the present application are commonly assigned. Therefore, Applicant respectfully requests withdrawal of the obviousness-type double patenting rejection of claims 1-14.

CONCLUSION

In view of the above, Applicant respectfully submits that the Application is in condition for allowance. If there are any outstanding issues, Applicant request the Examiner telephone the Applicant's attorney to resolve such issues.

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EXHIBIT A
AMENDED PORTIONS OF THE SPECIFICATION MARKED-UP TO SHOW CHANGES

The paragraph on page 25, line 5.

The thermal effects on grating substrate 11(a) also increase losses by causing substantially monochromatic beams 24 to shift from their intended positions on fiber ends 12. Referring to FIG. 6, in practice, beams 24 are not truly monochromatic, but rather a tight range of wavelengths <u>30</u> about a center frequency. Each beam 24 has a central wavelength 32 which is the representative wavelength to which an optical signal is associated. Each central wavelength 32 is generally predefined, and may correspond with an industry standard, such as the standards set by the International Telecommunication Union. As temperature changes the dispersion of grating assembly 11, beam 24 is no longer diffracted at the nominal angle (per equation 6B), and the central wavelength of beams 24 deviates from fiber 12 ends.

ABSTRACT OF THE DISCLOSURE

A wavelength division multiplexer/demultiplexer (WDM) for use in an optical network and in an optical performance monitor that minimizes increases in insertion losses over temperature variations[. The WDM] has a structure for holding at least one optical component. A diffraction grating assembly having a substrate is held in relation to the at least one optical component by the structure. A lens assembly having a focal length is held in relation to the at least one optical component. The coefficient of thermal expansion of the lens assembly and structure are approximately equal. [The lens assembly is constructed from a material chosen to minimize its variance in focal length over temperature.] The grating assembly has an angular dispersion that changes with temperature and the product of the focal length and angular dispersion remains constant over temperature. The WDM further comprises a prism having a change in index of refraction with temperature that is approximately equal to a negative of a coefficient of thermal expansion of the substrate. [The substrate has a coefficient of thermal expansion approximately equal to a negative of a coefficient of thermal expansion of air.]

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EXHIBIT B
AMENDED CLAIMS MARKED-UP TO SHOW CHANGES

1. (Amended) A WDM comprising:

a structure extending longitudinally from one end to another for supporting components of the WDM;

at least two optical components supported at the one end of the structure for transmitting and receiving optical signals;

a diffraction grating supported at the other end of the structure for diffracting the optical signals from the optical components;

a lens assembly supported by the structure and disposed between the optical components and the diffraction grating, the lens assembly having a focal length for focusing the optical signals in relation to the optical components; and

wherein the coefficient of thermal expansion of the diffraction grating is a value chosen to be approximately equal to a negative of [the] a change of index of refraction with temperature of air.

7. (Amended) The WDM of claim 1 wherein a coefficient of thermal expansion of the structure and the change in index of refraction with temperature of the lens assembly are values selected so that the length of the structure changes proportionally with the focal length of the lens assembly in response to temperature changes in the structure and lens assembly, whereby the lens assembly remains substantially focused in relation to the optical components.

8. (Amended) An optical network having a wavelength division multiplexer/demultiplexer (WDM) comprising:

a structure extending longitudinally from one end to another for supporting components of the WDM;

at least two optical components supported at the one end of the structure for transmitting and receiving optical signals;

a diffraction grating supported at the other end of the structure for diffracting the optical signals from the optical components;

a lens assembly supported by the structure and disposed between the optical components and the diffraction grating, the lens assembly having a focal length for focusing the optical signals in relation to the optical components; and

wherein the coefficient of thermal expansion of the diffraction grating is a value chosen to be approximately equal to a negative of [the] a change of index of refraction with temperature of air.

14. (Amended) The optical network of claim 8 wherein a coefficient of thermal expansion of the structure and the change in index of refraction with temperature of the lens assembly are values selected so that the length of the structure changes proportionally with the focal length of the lens assembly in response to temperature changes in the structure and lens assembly, whereby the lens assembly remains substantially focused in relation to the optical components.

EXHIBIT C
FULL SET OF CLEAN CLAIMS

1. (Amended) A WDM comprising:

a structure extending longitudinally from one end to another for supporting components of the WDM;

at least two optical components supported at the one end of the structure for transmitting and receiving optical signals;

a diffraction grating supported at the other end of the structure for diffracting the optical signals from the optical components;

a lens assembly supported by the structure and disposed between the optical components and the diffraction grating, the lens assembly having a focal length for focusing the optical signals in relation to the optical components; and

wherein the coefficient of thermal expansion of the diffraction grating is a value chosen to be approximately equal to a negative of a change of index of refraction with temperature of air.

2. The WDM of claim 1 wherein the structure has a first coefficient of thermal expansion and the lens assembly has a second coefficient of thermal expansion, and wherein the first and second coefficients of thermal expansion are approximately equal.

3. The WDM of claim 1 wherein the structure has a coefficient of thermal expansion within 3 PPM/degree Celsius of a coefficient of thermal expansion of the lens assembly.

4. The WDM of claim 1 wherein the lens assembly is constructed of a material chosen to minimize its variance in focal length over temperature.

5. The WDM of claim 1 wherein the lens assembly has a change of index of refraction with temperature from 0 to -2.5 PPM/degree Celsius.

6. The WDM of claim 1 wherein the diffraction grating has a coefficient of thermal expansion of 0.5 PPM/degree Celsius to 1.5 PPM/degree Celsius.

7. (Amended) The WDM of claim 1 wherein a coefficient of thermal expansion of the structure and the change in index of refraction with temperature of the lens assembly are values selected so that the length of the structure changes proportionally with the focal length of the lens assembly in response to temperature changes in the structure and lens assembly, whereby the lens assembly remains substantially focused in relation to the optical components.

8. (Amended) An optical network having a wavelength division multiplexer/demultiplexer (WDM) comprising:

a structure extending longitudinally from one end to another for supporting components of the WDM;

at least two optical components supported at the one end of the structure for transmitting and receiving optical signals;

a diffraction grating supported at the other end of the structure for diffracting the optical signals from the optical components;

a lens assembly supported by the structure and disposed between the optical components and the diffraction grating, the lens assembly having a focal length for focusing the optical signals in relation to the optical components; and

wherein the coefficient of thermal expansion of the diffraction grating is a value chosen to be approximately equal to a negative of a change of index of refraction with temperature of air.

9. The optical network of claim 8 wherein the structure has a first coefficient of thermal expansion and the lens assembly has a second coefficient of thermal expansion, and wherein the first and second coefficients of thermal expansion are approximately equal.

10 The optical network of claim 8 wherein the structure has a coefficient of thermal expansion within 3 PPM/degree Celsius of a coefficient of thermal expansion of the lens assembly.

11 The optical network of claim 8 wherein the lens assembly is constructed of a material chosen to minimize its variance in focal length over temperature.

12 The optical network of claim 8 wherein the lens assembly has a change of index of refraction with temperature from 0 to -2.5 PPM/degree Celsius.

13 The optical network of claim 8 wherein the diffraction grating has a coefficient of thermal expansion of 0.5 PPM/degree Celsius to 1.5 PPM/degree Celsius.

14. (Amended) The optical network of claim 8 wherein a coefficient of thermal expansion of the structure and the change in index of refraction with temperature of the lens assembly are values selected so that the length of the structure changes proportionally with the focal length of the lens assembly in response to temperature changes in the structure and lens assembly, whereby the lens assembly remains substantially focused in relation to the optical components.